**Yashica TL Electro-X Service Manual**

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## Foreword

This manual contains matters necessary for repair and servicing of the Yashica TL Electro-X.

The Yashica TL Electro-X incorporates the following functional features which make it completely different from other focal shutter single-lens reflex cameras:

1. Thru-the-lens exposure readout system which does not require an exposure meter and provides measurement of the correct exposure at stopped-down aperture through preselection of either the lens aperture or shutter speed.
2. Electronic-controlled focal plane shutter affording an infinite range of intermediate shutter speeds (and providing faithful function at 1/1000 sec. even when battery power is exhausted).

Its exposure readout and electronic shutter systems follow the pattern of those featured in the Lynx-5000E (14E) and Electro 35, and their merits are outlined in their respective repair manuals. Generally speaking, therefore, the Yashica TL Electro-X can be said to be an equipment which offer all advantanges of the above-mentioned cameras.

## Principles of operation

The circuitry of the Yashica TL Electo-X can be generally classified into the exposure readout circuit, shutter circuit and battery checker circuit. The exposure readout circuit and the shutter circuits are linked to each other with the aid of a slide resistor.

A coaxial dual variable resistor is employed for this purpose. Its top section forms the balancing resistor (VR-1), while its bottom section functions as the shutter speed resistor (VR-2).

The circuit pattern consists of a combination of the exposure readout circuit of the Lynx-5000E (14E) and the shutter circuit of the Electro 35, and correlation between the functions of these two circuits is maintained through incorporation of the variable resistor.

### 1.1 Exposure Readout Circuit

The intensity of the light controlled by means of the diaphragm (exposure reading through stopped-down) is sensed by the two CdS sensors incorporated in the pentaprism housing on both sides of the viewfinder eyepiece.

Being a photoconductive cell, the CdS serves to vary the resistance value at a ratio inversely proportional to the intensity of light to which it is exposed.

Because the CdS and the BALANCING resistor (VR-1) are series connected, the voltage from the power supply is affected by the degree of resistance offered by both and the voltage equivalent to the VR-1 is applied to (T5)-(T1).

Both the OVER and UNDER indicator lamps fail to turn on (indicating correct exposure) when the voltage range at (T5)-(T1) is between 0.6 V and 1.0 V. The OVER indicator lamp turns on when the voltage rises above this level and the UNDER indicator lamp alights when it falls short of this range. Consequently, the procedure for setting the correct exposure (indicated by the OVER/UNDER lamps failing to turn on) consists of adjusting the VR-1 to a setting where a voltage supply of 0.6 V to 1.0 V will be maintained at (T5)-(T1) as against the CdS resistance value.

**1.2** Simultaneously with the setting of the resistance value of the VR-1 through exposure readout, the shutter speed resistor (VR-2) which is set coaxially is adjusted accordingly.

**a**. The trigger switch (SW-5) is adjusted to "ON" position when the shutter is charged.

**b**. When the shutter release button is depressed, the power switch (SW-2) on the shutter side is turned on, setting the power supply to the circuit. At this stage, however, the Tr6 and Tr7 are at "ON" position because Tr5 is turned off. Consequently, the magnet functions to hold the rear sector of the shutter.

**c**. At the next stage, the trigger switch is turned off and the electric current controlled by the setting of the shutter speed resistor begins to flow and the charging of the condensor C1 starts. Immediately after the trigger switch is turned off, the front shutter sector is activated mechanically and starts its function.

**d**. The electric potential of the condenser C1 rises gradually and, when it reaches a given (approx. 2.4 V), the Tr5 turns on and, simultaneously with this, the Tr6 and Tr7 are switched off. This cuts off the supply of electric power to the magnet which then loses its force of attraction, causing the rear sector to commence operation.

**e**. As soon as the rear sector completes its run over the entire picture area, the SW-2 is turned off, thus cutting off the supply of the electric power to the shutter circuit and completing the shutter operation.

**Principle of variation of the shutter speeds**

The shutter speed is decided through setting of the shutter speed resistor (VR-2).

If, for instance, only a very low resistance is offered by the VR-2, a large flow of electric current is supplied to the condenser C1, necessitating only a very short period of time to charge it to full capacity. In other words, the terminal voltage of the C1 rises to a given value within a very short period of time, causing the rear sector to start to function with hardly any time delay and thus providing fast exposure. If, on the other hand, a high resistance is offered, a restricted flow of electric current is supplied, requiring a considerable period of time before the terminal voltage of the C1 can reach level and thus providing long exposure.

**Bulb Exposure**

An insulating material is set between the 2 sec. and B settings of the resistor VR-2 and this serves to distinguish between the normal shutter speed resistor and Bulb resistor. The SW-4 serves as this insulating material.

When the shutter speed control dial is adjusted to "B" setting, the brush of the VR-2 comes into contact with the Bulb resistor.

The Bulb switch (SW-6) turns off when the shutter release button is depressed and turns on when the pressure is released.

When the shutter speed control dial is adjusted to "B" setting and the shutter release button is depressed, the bulb resistor and the brown lead wire are cut off from the plus circuit (pink) and, therefore, no electric power is supplied to the condenser C1. Because the voltage at both terminals of the C1 fails to rise, the normal switching of the transistors does not take place, causing the magnet to hold the rear shutter all along.

When pressure on the shutter release button is released, the SW-6 is turned on. This sets the flow of electric current through the Bulb resistor, starts the charging of the C1 and initiates the switching of the transistors, causing the rear sector to be released from its original position and thus closing the shutter.

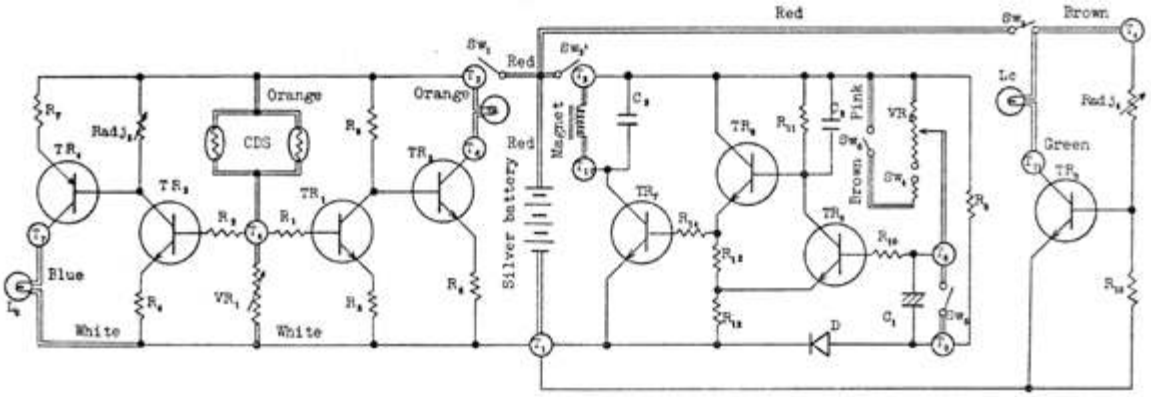
The Bulb resistor does not wield any effect on the shutter function itself over the duration the shutter release button is depressed. It is rather employed as a protection for the transistor, owing to the fact that a huge flow of current is supplied to the base of the Tr5 when pressure on the shutter button is released and the SW-6 is turned on. Without this resistor serving as a protection, the transistor is liable to be damaged due to the sudden high flow of electric current.

**ASA film speed setting**

The brush mounting ring of the BALANCING resistor (VR-1) is designed in such a manner as to enable ready rotation other than through manipulation of the main spindle. In other words, ASA film speed setting actually consists of rotating the VR-1 differentially without affecting the function of the VR-2.

# Schematic diagram of the Yashica TL Electro-X

The small version:

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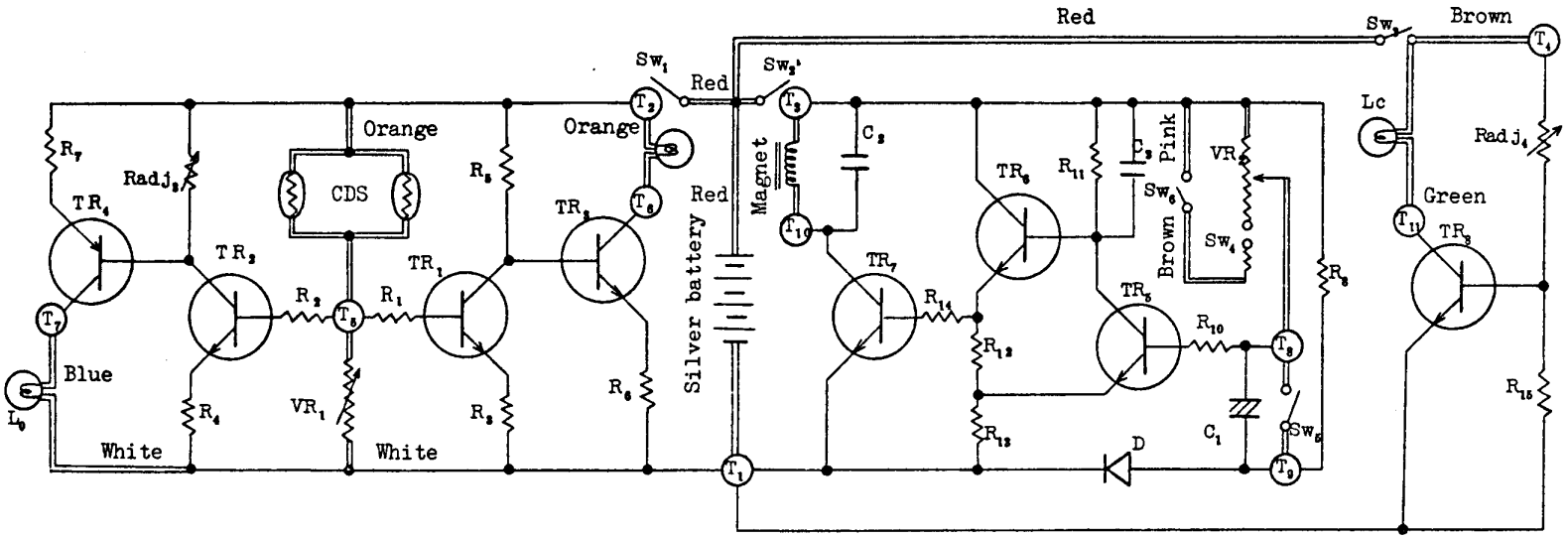
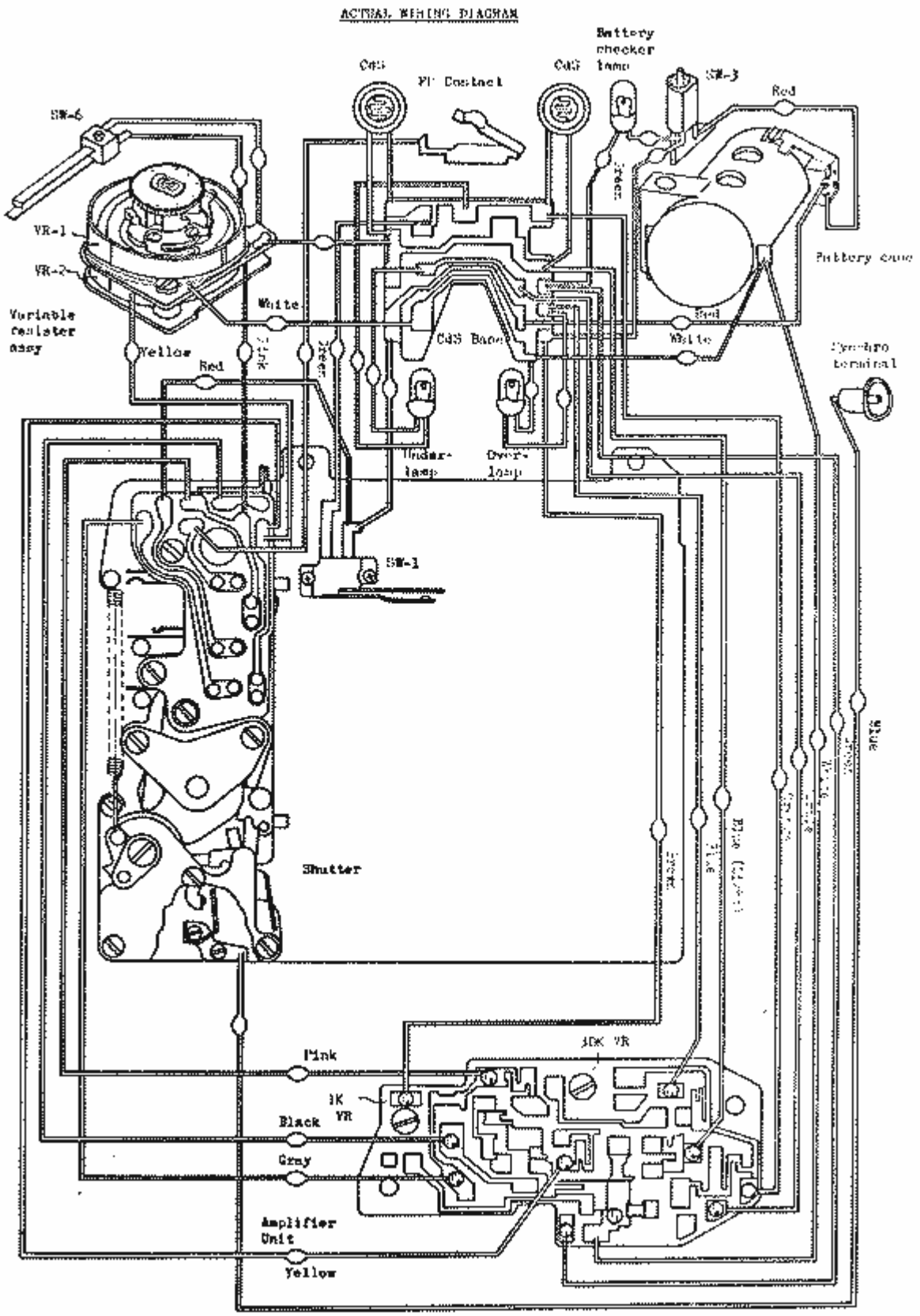
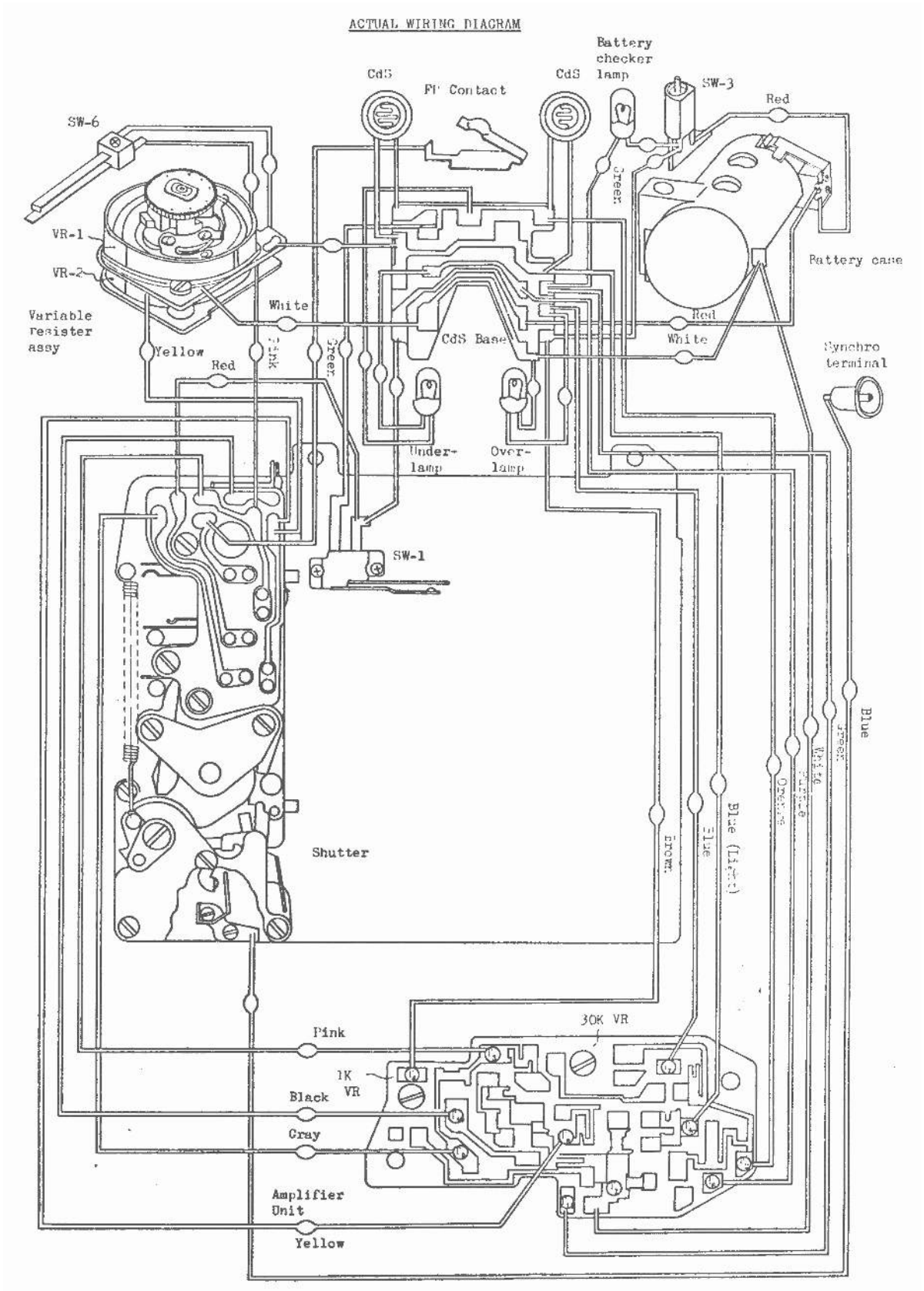
The large version (for printing):


Red
Sw3
Brown
T4
Sw1
Sw2'
Red
T2
T3
Orange
Orange
Lc
Radj4
R7
Radj3
CDS
R5
C2
Magnet
Red
TR6
R11
C3
Pink
VR
T6
TR4
TR3
T10
Sw6
Green
T11
TR2
TR1
TR7
Sw4
Brown
R9
T7
R2
T5
R1
R14
TR5
R10
T8
Blue
L0
R4
VR1
R3
R6
Silver battery
R12
R13
D
C1
Sw5
T1
T9
R15
White
White

# Yashica TL Electro-X wiring diagram

Here is a small (600x843) version of the diagram. It isn't all that legible but I was trying to keep the file size down. You can click here for a larger (2017x2835, 168Kbyte, 300DPI) version of the diagram. The larger version is suitable for printing at 300 DPI and should give an image 6.7 x 9.5 inches (17x24 cm).


ACTUAL WIRING DIAGRAM
Battery checker lamp
CdS
PT Contact
CdS
SW-3
Red
SW-6
VR-1
VR-2
Variable resister assy
White
Yellow
Red
CdS Base
Battery case
Terminal
Under-lamp
Over-lamp
SW-1
Shutter
Pink
3DK VR
1K VR
Black
Gray
Amplifier Unit
Yellow


ACTUAL WIRING DIAGRAM
Battery checker lamp
CdS
PT Contact
CdS
SW-3
Red
SW-6
VR-1
VR-2
Variable resister assy
White
Yellow
Red
Pink
Green
CdS Base
Red
White
Battery case
Synchro terminal
Under-lamp
Over-lamp
SW-1
Shutter
Blue
Green
White
Orange
Blue (Light)
Blue
Brown
30K VR
Pink
1K VR
Black
Gray
Amplifier Unit
Yellow

**Testing and Measuring Instruments**

The use of the following instruments is recommended in inspection and repair of the Yashica TL Electro-X:

**Voltage Stabilizer**

This instrument is indispensable to assuring high efficiency in repair and servicing. It is advisable to use a voltage stablizer featuring a voltmeter and ampre-meter that provides ready checking and reading of the output voltage and current. Moreover, teh use of a battery tool and lead wires featuring clips at one end is recommended. By installing the battery tool in the battery chamber in place of the mercury battery, electric power can be supplied readily from the voltage stabilizer.

Insulating Resistance Meter

This instrument which features an exclusive resistance scale permits reading of resistance over a range of several megohms to several hundred megohms and is employed in the same manner as an ordinary tester. Since it uses a high voltage power (approx. 500V), however, utmost precaution must be exercised to prevent adverse effect on other circuits. In the course of use of this insulating resistance meter, particular care must be taken to protect the transistors from the high-tension supply.

Focal Plane Shutter tester

This instrument permits varied types of tests and measurements of the function of the focal plane shutter, including the shutter speed (at the top, center and bottom of the picture area), speed of operation of the front and rear sectors of the shutter, and time-lag of the X flash synchronizer contact.

Standard Light Source

The standard light source is used for checking the exposure readout circuit. It is advisable to incorporate this standard light source in the light value tester which is generally used for testing and repair.

**Methods of Repair**

**4.1 Battery checker circuit**

**4.1.1 Battery checker lamp fails to turn on.**

**4.1.1.1 Malfunction of the battery checker switch (SW-3).**

Undertake continuity test by employing a tester.

**4.1.1.2 Burn-out of the lamp filament.**

**4.1.1.3**

Remove either one of the lamp terminals (brown or green) from the amplifier unit and test the lamp for continuity with the aid of a tester. If no continuity is determined, it is an indication of a lamp blow-out, necessitating lamp replacement.

**4.1.1.3 Improper contact of the battery checker voltage regulating resistor (1K ohm semi-fixed resistor) and malfunction of the transistors.**

Install the battery, set the SW-3 to "ON" position and check the voltage of (T11) to (T1). If the voltage is determined to be about the same level as that of the power source, it is an indication of either an improper contact of the 1K ohm VR or a malfunction of the transistors.

In this case, check the soldered ends of the 1K ohm VR. If both the soldered sections are found to be in order, replace the amplifier unit.

#### 4.1.2 Improper voltage range.

The battery checker lamp should normally turn on at a voltage range of over 3.8V and not exceeding 4.2V under a temperature of 25°C. Since the battery checker circuit has a temperature characteristics of -0.1V/+10°C when a temperature of 25°C is taken as a standard, due consideration must be given to adjustment of the voltage range in accordance with the temperature of the room in which the measurement is being taken. For instance, under a temperature of 15°C, the voltage range will be 0.1V over the standard 25°C and will therefore be over 3.9V and not exceeding 4.3V. On the other hand, the voltage range will be over 3.7V and not exceeding 4.1V at a room temperature of 35°C.

##### 4.1.2.1 Lighting voltage exceeds 4.2V.

This is attributed to improper adjustment of the battery checker voltage regulating resistor (1K ohm VR), providing a resistance which is beyond the normal level. To repair, turn the adjustment screw of the VR in a right motion and reduce the resistance to an appropriate level.

##### 4.1.2.2 Lighting voltage falls short of 3.8V

This is due to excessively low resistance of the 1K ohm VR. To repair, turn the adjustment screw of the VR in a left motion and increase the resistance.

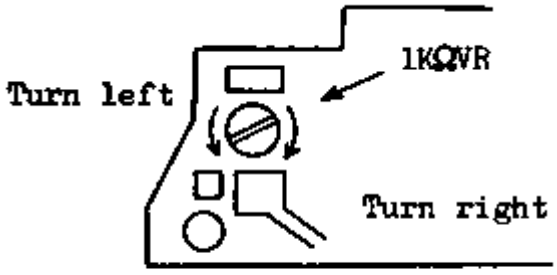



Fig. 1

### 4.2 Malfunction of the exposure readout circuit

#### 4.2.1 Both the "OVER" and "UNDER" indicator lamps fail to turn on.

##### 4.2.1.1 Malfunction of the exposure readout switch (SW-1).

Test the SW-1 for continuity. Set the tester rods between the red and orange patterns of the CdS baseplate and turn on the exposure readout activator switch. In case no continuity is determined, it is an indication of either disconnection of the wiring, improper adjustment of the switch contact pieces or accumulation of dust or other foreign particles within the switch. To repair, check the wiring and clean the contact pieces of the switch.

##### 4.2.1.2 Malfunction of the amplifier unit.

If both the "OVER" and "UNDER" indicator lamps are found to be in normal working condition and malfunction outlined in 4.2.1.1 cannot be determined, it is an indication of a malfunction of the transistors featured in the unit. In such a case the entire unit must be replaced.

4.2.2 "UNDER" indicator lamp turns on normally, but "OVER" lamp fails to light, or "OVER" lamp functions normally, but "UNDER" lamp fails to turn on.

**4.2.2.1 Burn-out of the "OVER" indicator lamp ("UNDER" indicator lamp).**

Remove one of the terminals of the "OVER" (or "UNDER") indicator lamp and undertake continuity test. If no continuity is determined, make replacement of the lamp.

**4.2.2.2 Malfunction of the amplifier unit.**

If the indicator lamps are found to be in order, it is an indication of a malfunction of the transistors of the amplifier unit, necessitating replacement of the unit.

**4.2.3 "OVER" indicator lamp turns on continuously and "UNDER" lamp fails to turn on.**

This malfunction can be attributed to excessive rise in the electric potential of (T5)-(T1) due to either shortcircuiting of the CdS or failure of the BALANCING resistor (VR-1) to provide normal function. Normally, the voltage at (T5)-(T1) should be within the range of 0.6V and 1.0V at the point where both lamps turn off.

**4.2.3.1 Shortcircuiting of the CdS.**

Because shortcircuiting of the CdS itself is quite improbable, check whether or not the CdS baseplate is shortcircuited.

Remove the blue lead wire of the amplifier unit on the CdS baseplate, apply the tester rods between the colored patterns and undertake continuity test.

When the lens aperture is set manually to f/5.6 and a light emitted by a standard light source is directed, each CdS should give the following resistance value (The reading should be approximately half this figure in case measurement is taken of both CdS cells simultaneously):

| | |
|---|---|
| BLV 7 | 60 - 160K ohm |
| BLV 11 | 10 - 20K ohm |
| BLV 15 | 1.35 - 3.5K ohm |

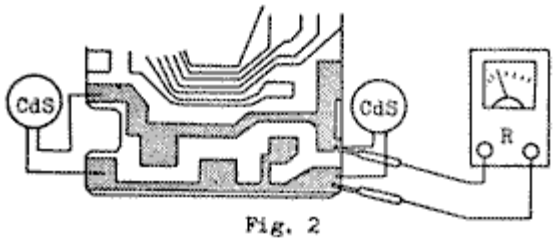


Fig. 2

4.2.3.2 Failure of the BALANCING resistor (VR-1) to provide normal resistance function

Remove the blue lead wire of the VR-1 from the CdS baseplate and measure the resistance value of the VR-1. In this case, the resistance reading should be within the allowable limit specified in the chart given in Fig 4.2.3.1 [above].

**4.2.3.3 Malfunction of the amplifier unit.**

In case the voltage at (T5)-(T1) is determined to be normal, the cause can be attributed to malfunction of the transistors, in which case the amplifier unit must be replaced.

**4.2.4 "UNDER" indicator lamp turns on continuously and "OVER" lamp fails to alight.**

This is due to either a decline in (T5)-(T1) voltage to almost 0V caused by shortcircuiting of the VR-1 or failure of the CdS to provide normal resistance, or malfunction of the amplifier unit.

**4.2.4.1 Failure of the CdS unit to provide normal resistance.**

Undertake continuity test according to procedure outlined in 4.2.3.1. The resistance reading in this case should also correspond to that given in the same paragraph. If the resistance is found to be excessive, remove one CdS cell at a time and check their resistance individually. The resistance reading in this case should be within the allowable limit specified in Fig. 2.3.1.

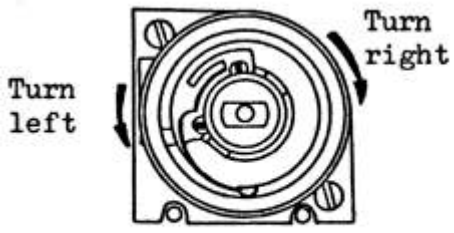
**4.2.4.3 Shortcircuiting of the BALANCING resistor (VR-1)**

**Make through check according to procedure outlined in 4.2.3.2.**

**4.2.5 Adjustment of the exposure readout circuit.**

Adjustment of the exposure readout circuit consists of either one of the following two methods:

One method consists of loosening the two screws on top of the slide resistor assembly and turning to offset resistor ring to alter its position in relation with the brush. This method (providing a balanced shifting of the offset resistor characteristics) enables precise regulation of the 'light turn-off point' without altering the 'light turn-off range'. The other consists of adjustment of the 30K semi-fixed resistor incorporated in the amplifier unit. This provides effective regulation of the 'light turn-off point' of the "OVER" indicator lamp.




Slide resistor

Fig. 3

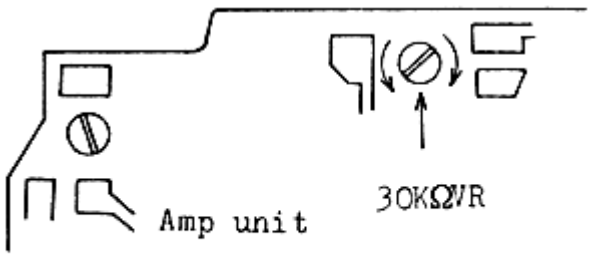



Fig. 4

**4.2.5.1 Improper adjustment of the 'light turn-off' position.**

1. The 'light turn-off' position generally tends to shift toward a direction providing under-exposure at all light levels.

This malfunction is caused when the resistance of the offset resistor (VR-1) rises to a level beyond the standard reading. To repair, turn the offset resistor ring in a left motion to effect a balanced shifting of the resistor characteristics.

2. The 'light turn-off' position generally tends to shift toward a direction providing over-exposure at all light levels.

This malfunction is caused when the resistance of the BALANCING resistor (VR-1) declines below the standard level. To make adjustment, turn the offset resistor ring in a right motion.

#### 4.2.5.2 The 'light turn-off' range is either excessive or too limited.

The factory standard calls for a 'light turn-off' range of 1/3 to 1-2/3 EV and, therefore, the following adjustment must be made in case the range is determined to be excessive or too limited. Because this range is adjusted on the basis of the function of the "OVER" indicator lamp, the VR-1 must be properly regulated in case it is determined after adjustment of the 'light turn-off range' that the 'light turn-off point' has shifted from the normal position. (Refer to pertinent details given later.)

**1. Excessively wide 'light turn-off range'.**

This can be attributed to adjustment of the 'light turn-off range' adjustment resistor (30K ohm VR) to a resistance reading below the normal level. To repair, turn the resistor in a left motion with the aid of a screw-driver to a setting that provides higher resistance.

**2.** The 'light turn-off' position generally tends to shift toward a direction providing over-exposure at all light levels.

This malfunction is caused when the resistance of the BALANCING resistor (VR-1) declines below the standard level. To make adjustment, turn the offset resistor ring in a right motion.

#### 4.2.5.3 In case both the 'light turn-off range' and 'light turn-off position' are determined to be not up to standard.

First of all, adjust the 'light turn-off' adjustment resistor (30K ohm) and set the 'light turn-off range' to normal level. Then, adjust the BALANCING resistor ring (VR-1) and set the 'light turn-off point' to the required position.

### 4.3 Shutter circuit

#### 4.3.1 Shutter speed

##### 4.3.1.1 Malfunction of the shutter power switch (SW-2)

In this case, the SW-2 fails to turn on. When using a DC voltage stabilzer, a flow of electric current to the extent of about 30ma (at 5.5V) should be determined at the time the shutter is released. Poor contact of the SW-2 is caused occasionally by accumulation of dust or other foreign particles. To repair, therefore, wipe and clean the contact pieces meticulously.

##### 4.3.1.2 Disruption of the wiring of the electro-magnet.

Remove the black lead wire and undertake continuity test on the electro-magnet. The resistance value should be approximately 270 ohms (with both electro-magnets).

##### 4.3.1.3 Shortcircuiting of the shutter speed resistor (VR-2) circuit.

This can be attributed to either shortcircuiting of the shutter printed wiring panel or shortcircuiting within the VR-2. In this case, remove the yellow or pink lead wire and check the insulating resistance between the colored patterns. Also, undertake continuity test of the VR-2.

The resistance of the VR-2 should be within the limit specified in Fig. 2.2.2.

##### 4.3.1.4 Malfunction of the amplifier unit.

If everything is found to be in order after undertaking [the] thorough check outlined in the preceeding three paragraphs, the cause can be pinpointed on malfunction of the transistors, in which case the amplifier unit must be replaced.

#### 4.3.2 Shutter remains open.

The shutter sectors remain open at "B" setting even after pressure on the shutter release button is released. This is attributed to the fact that the electric potential of the charging condenser (C1) fails to rise because either the shutter speed resistor (VR-2) or the trigger switch (SW-5) does not reset to the "OFF" position.

**4.3.2.1 Failure of the shutter resistor (VR-2) to provide normal resistance.**

Check the resistance of the VR-2 according to the procedure outlined in 4.3.1.3. If no continutiy is determined, it is an indication of a disconnection of the yellow or pink lead wire or poor contact of the contact pieces of the VR-2.

**4.3.2.2 The trigger switch (SW-5) fails to turn off.**

Remove the gray lead wire from the shutter printed wiring panel and undertake continuity test by setting the shutter to the "B" setting.

This test must be undertaken by setting the shutter control to either "B" or slow shutter speed setting, because the SW-5 sets to "OFF" position only over the duration the shutter remains open.

If it fails to set to "OFF" position, it is an indication of a malfunction of the SW-5; therefore, make proper adjustment of its contact pieces. Because the position at which the SW-5 sets to "OFF" position directly affects the exposure time (particularly in case of high shutter speeds), the precise position where it turns off must be checked meticulously after adjusting the contact pieces.

**4.3.2.3 Malfunction of the amplifier unit.**

If the shutter speed resistor and trigger switch are found to be in order, the cause can be attributed to malfunction of the transistors, causing the shutter to remain open because no electric current flows to the electro-magnet even if charging of the condenser (C1) takes place. To repair, make replacement of the amplifier unit.

**4.3.2.4 The shutter remains open only at "B" setting.**

Undertake necessary check because this can be attributed to poor contact of the Bulb switch (SW-6) or poor contact between the Bulb resistor of the VR-2 and the contact piece.

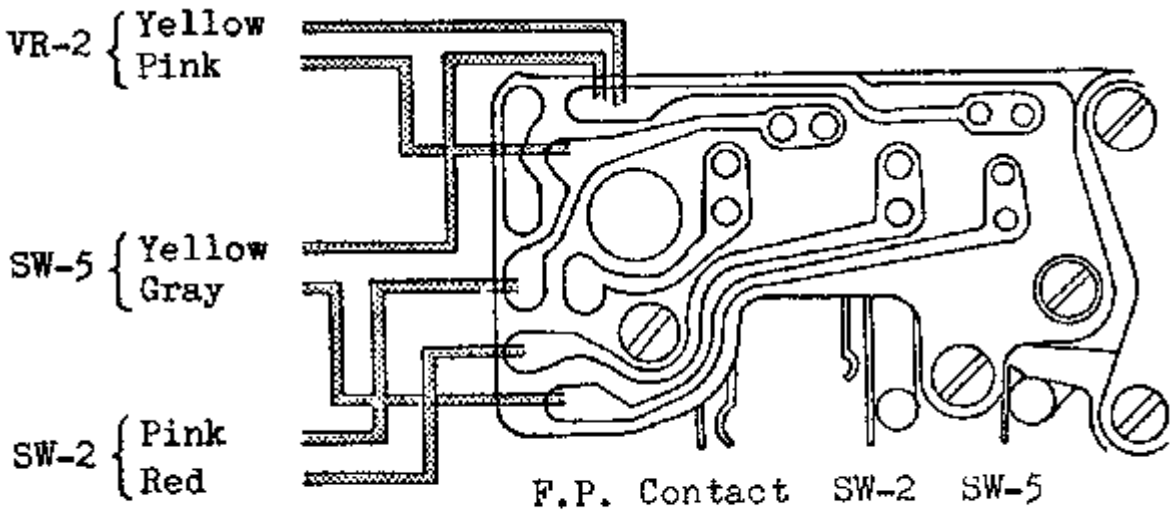



Fig. 5

**4.3.3 Shutter closes automatically at "B" setting.**

Specifically, this malfunction consists of the shutter closing automatically at "B" setting while the shutter release button is being depressed or of the shutter functioning at speeds faster than the normal at slow speeds (ranging from 1/8 to 1 sec.).
This is caused by improper insulation between the plus (pink) circuit and the "Bulb" resistor incorporated in the shutter speed resistor (VR-2) as well as the brown lead wire circuit.

**4.3.3.1 Poor insulation of the shutter speed resistor.**

After adjusting the shutter speed control dial to 1/1000 sec. setting, check the insulating resistance of both terminals of the "Bulb" switch (SW-6) with the aid of an insulating resistance meter. The reading in this case should be 100 megohms or more.
The points where poor insulation may be caused most commonly are:

1. Soldered sections of the lead wires of the "Bulb" switch (SW-6) or improper adjustment of the position of the contact pieces.
2. Soldered sections of the lead wires of the shutter speed resistor (VR-2).
3. Poor insulation of the "Bulb" resistor.

In case of (b) and (c) above, wipe and clean the pertinent parts carefully with lacquer thinner.

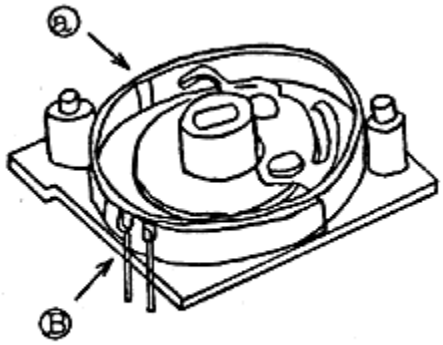



Fig. 6

**4.3.3.2 Shutter function at about 8ms occasionally at "B" or settings slower than 1/125 sec.**

There are times where the shutter functions at about 8ms [1/125 sec.] continuously or once in about ten times.

This is caused because the shutter power switch (SW-2) is not held properly. In other words, the SW-2 (red and pink) is shortcircuited on the shutter printed wiring panel. If, after operating the shutter about twenty times, it provides normal function, it is an indication that the activating lever of the SW-2 fails to hold the power switch-off lever. In this case, replacement of the shutter is required. 4.3.4 Adjustment of the shutter speed. In case the shutter functions either excessively fast or slow at all shutter speeds, proper adjustment can be accomplished by turning the shutter speed resistor ring in the required direction.

The adjustment screw on the base of the slide resistor assembly is linked directly to the shutter speed resistor ring. By loosening this screw and turning it either to the left or right along the guide slot, proper adjustment can be made.

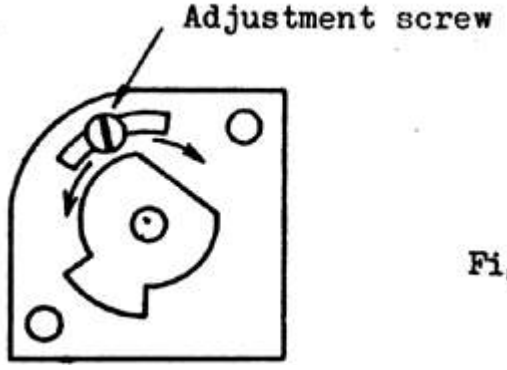



Fig. 7

**4.3.4.1 Shutter functions at a speed faster than the normal rate.**

This is caused when the resistance of the shutter speed resistor (VR-2) is set below the normal level. Proper adjustment can be made by shifting the resistor in the direction to the right of the main spindle when viewed from the bottom of the resistor itself. 4.3.4.2 The shutter functions at a speed slower than the normal rate.

This is caused when the resistance of the VR-2 is set beyond the normal level. To make

proper adjustment, turn the resistor ring in a left motion. 4.3.4.3 The shutter functions too fast at high speed settings and too slowly at slow speed settings, or vice versa.
Because this can be attributed most commonly to the characteristics of the shutter speed resistor (VR-2), check the resistance according to the procedure given in 4.3.1.3.
In case it is determined that the resistor fails to provide the normal characteristics, replacement of the resistor is required because there is no effective means of adjustment.